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# Computer Network, Systems, and Database Administrators

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## Significant Points

- Employment is projected to grow much faster than the average for all occupations and add 286,600 new jobs over the 2008–18 decade.
- Excellent job prospects are expected.
- Workers can enter this field with many different levels of formal education, but relevant computer skills are always needed.

## Nature of the Work

Information Technology (IT) has become an integral part of modern life. Among its most important functions are the efficient transmission of information and the storage and analysis of information. The workers described below all help individuals and organizations share and store information through computer networks and systems, the Internet, and computer databases.

*Network architects* or *network engineers* are the designers of computer networks. They set up, test, and evaluate systems such as local area networks (LANs), wide area networks (WANs), the Internet, intranets, and other data communications systems. Systems are configured in many ways and can range from a connection between two offices in the same building to globally distributed networks, voice mail, and e-mail systems of a multinational organization. Network architects and engineers perform network modeling, analysis, and planning, which often require both hardware and software solutions. For example, setting up a network may involve the installation of several pieces of hardware, such as routers and hubs, wireless adapters, and cables, as well as the installation and configuration of software, such as network drivers. These workers may also research related products and make necessary hardware and software recommendations, as well as address information security issues.

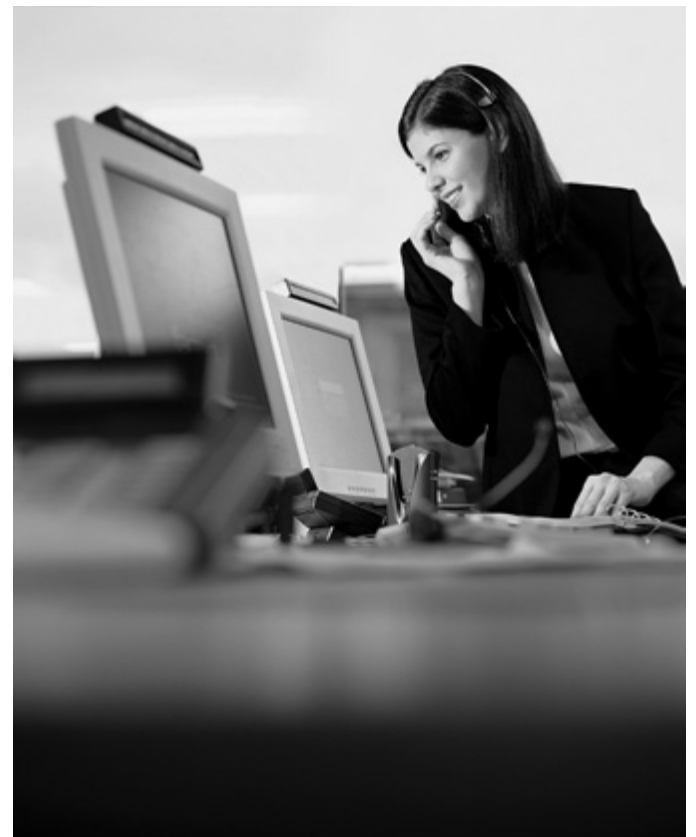
*Network and computer systems administrators* design, install, and support an organization's computer systems. They are responsible for LANs, WANs, network segments, and Internet and intranet systems. They work in a variety of environments, including large corporations, small businesses, and government organizations. They install and maintain network hardware and software, analyze problems, and monitor networks to ensure their availability to users. These workers gather data to evaluate a system's performance, identify user needs, and determine system and network requirements.

Systems administrators are responsible for maintaining system efficiency. They ensure that the design of an organization's computer system allows all of the components, including computers, the network, and software, to work properly together. Administrators also troubleshoot problems reported by users and by automated network monitoring systems and make recommendations for future system upgrades. Many of these workers are also responsible for maintaining network and system security.

*Database administrators* work with database management software and determine ways to store, organize, analyze, use, and present data. They identify user needs and set up new computer databases. In many cases, database administrators must integrate data from old systems into a new system. They also test and coordinate modifications to the system when needed, and troubleshoot problems when they occur. An organization's database administrator ensures the performance of the system, understands the platform on which the database runs, and adds new users to the system. Because many databases are connected to the Internet, database administrators also must plan and coordinate security measures with network administrators. Some database administrators may also be responsible for database design, but this task is usually performed by *database designers* or *database analysts*. (Database designers are covered in the *Handbook* section on computer software engineers and computer programmers.)

*Computer security specialists* plan, coordinate, and maintain an organization's information security. These workers educate users about computer security, install security software, monitor networks for security breaches, respond to cyber attacks, and, in some cases, gather data and evidence to be used in prosecuting cyber crime. The responsibilities of computer security specialists have increased in recent years as cyber attacks have become more sophisticated.

*Telecommunications specialists* focus on the interaction between computer and communications equipment. These workers design voice, video, and data-communication systems, supervise the installation of the systems, and provide maintenance



*Computer network, systems, and database administrators help organizations share and store information.*

## Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Computer network, systems, and database administrators .....	—	961,200	1,247,800	286,600	30
Database administrators .....	15-1061	120,400	144,700	24,400	20
Network and computer systems administrators .....	15-1071	339,500	418,400	78,900	23
Network systems and data communications analysts .....	15-1081	292,000	447,800	155,800	53
All other computer specialists.....	15-1099	209,300	236,800	27,500	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

and other services to clients after the systems are installed. They also test lines, oversee equipment repair, and may compile and maintain system records.

**Web developers** are responsible for the technical aspects of Web site creation. Using software languages and tools, they create applications for the Web. They identify a site's users and oversee its production and implementation. They determine the information that the site will contain and how it will be organized, and may use Web development software to integrate databases and other information systems. Some of these workers may be responsible for the visual appearance of Web sites. Using design software, they create pages that appeal to the tastes of the site's users.

**Webmasters** or **Web administrators** are responsible for maintaining Web sites. They oversee issues such as availability to users and speed of access, and are responsible for approving the content of the site. Webmasters also collect and analyze data on Web activity, traffic patterns, and other metrics, as well as monitor and respond to user feedback.

**Work environment.** Network and computer systems administrators, network architects, database administrators, computer security specialists, Web administrators, and Web developers normally work in well-lighted, comfortable offices or computer laboratories. Most work about 40 hours a week. However, about 15 percent of network and systems administrators; 14 percent of database administrators; and about 16 percent of network systems and data communications analysts (which includes network architects, telecommunications specialists, Web administrators, and Web developers) worked more than 50 hours per week in 2008. In addition, some of these workers may be required to be "on call" outside of normal business hours in order to resolve system failures or other problems.

As computer networks expand, more of these workers may be able to perform their duties from remote locations, reducing or eliminating the need to travel to the customer's workplace.

Injuries in these occupations are uncommon, but like other workers who spend long periods in front of a computer terminal typing on a keyboard, these workers are susceptible to eye-strain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

### Training, Other Qualifications, and Advancement

Training requirements vary by occupation. Workers can enter this field with many different levels of formal education, but relevant computer skills are always needed. Certification may improve an applicant's chances for employment and can help workers maintain adequate skill levels throughout their careers.

**Education and training.** Network and computer systems administrators often are required to have a bachelor's degree, although an associate degree or professional certification, along with related work experience, may be adequate for some positions. Most of these workers begin as computer support specialists before advancing into network or systems administration positions. (Computer support specialists are covered elsewhere in the *Handbook*.) Common majors for network and systems administrators are computer science, information science, and management information systems (MIS), but a degree in any field, supplemented with computer courses and experience, may be adequate. A bachelor's degree in a computer-related field generally takes 4 years to complete and includes courses in computer science, computer programming, computer engineering, mathematics, and statistics. Most programs also include general education courses such as English and communications. MIS programs usually are part of the business school or college and contain courses such as finance, marketing, accounting, and management, as well as systems design, networking, database management, and systems security.

For network architect and database administrator positions, a bachelor's degree in a computer-related field generally is required, although some employers prefer applicants with a master's degree in business administration (MBA) with a concentration in information systems. MBA programs usually require 2 years of study beyond the undergraduate degree, and, like undergraduate business programs, include courses on finance, marketing, accounting, and management, as well as database management, electronic business, and systems management and design. In addition to formal education, network architects may be required to have several years of relevant work experience.

For Webmasters, an associate degree or certification is sufficient although more advanced positions might require a computer-related bachelor's degree. For telecommunications specialists, employers prefer applicants with an associate degree in electronics or a related field, but for some positions, experience may substitute for formal education. Applicants for security specialist and Web developer positions generally need a bachelor's degree in a computer-related field, but for some positions, related experience and certification may be adequate.

**Certification and other qualifications.** Workers in these occupations must have strong problem-solving, analytical, and communication skills. Because they often deal with a number of tasks simultaneously, the ability to concentrate and pay close attention to detail also is important. Although these workers sometimes work independently, they frequently work in teams

on large projects. As a result, they must be able to communicate effectively with other computer workers, such as programmers and managers, as well as with users or other staff who may have no computer background.

Jobseekers can enhance their employment opportunities by earning certifications, which are offered through product vendors, computer associations, and other training institutions. Many employers regard these certifications as the industry standard, and some require their employees to be certified. In some cases, applicants without formal education may use certification and experience to qualify for some positions.

Because technology changes rapidly, computer specialists must continue to acquire the latest skills. Many organizations offer intermediate and advanced certification programs that pertain to the most recent technological advancements.

**Advancement.** Entry-level network and computer systems administrators are involved in routine maintenance and monitoring of computer systems. After gaining experience and expertise, they are often able to advance to more senior-level positions. They may also advance to supervisory positions.

Database administrators and network architects may advance into managerial positions, such as chief technology officer, on the basis of their experience. Computer specialists with work experience and considerable expertise in a particular area may find opportunities as independent consultants.

Computer security specialists can advance into supervisory positions, or may move into other occupations, such as computer systems analysts.

## Employment

Computer network, systems, and database administrators held about 961,200 jobs in 2008. Of these, 339,500 were network and computer systems administrators, 120,400 were database administrators, and 292,000 were network and data communications analysts. In addition, about 209,300 were classified as “computer specialists, all other,” a residual category.

These workers were employed in a wide range of industries. About 14 percent of all computer network, systems, and database administrators were in computer systems design and related services. Substantial numbers of these workers were also employed in telecommunications companies, financial firms and insurance providers, business management organizations, schools, and government agencies. About 7 percent were self-employed.

## Job Outlook

Employment is expected to grow much faster than the average, and job prospects should be excellent.

**Employment change.** Overall employment of computer network, systems, and database administrators is projected to increase by 30 percent from 2008 to 2018, much faster than the average for all occupations. In addition, this occupation will add 286,600 new jobs over that period. Growth, however, will vary by specialty.

Employment of network and computer systems administrators is expected to increase by 23 percent from 2008 to 2018. Computer networks are an integral part of business, and demand for these workers will increase as firms continue to invest in new technologies. The increasing adoption of mobile tech-

nologies means that more establishments will use the Internet to conduct business online. This growth translates into a need for systems administrators who can help organizations use technology to communicate with employees, clients, and consumers. Growth will also be driven by the increasing need for information security. As cyber attacks become more sophisticated, demand will increase for workers with security skills.

Employment of database administrators is expected to grow by 20 percent from 2008 to 2018. Demand for these workers is expected to increase as organizations need to store, organize, and analyze increasing amounts of data. In addition, as more databases are connected to the Internet, and as data security becomes increasingly important, a growing number of these workers will be needed to protect databases from attack.

Employment of network systems and data communications analysts is projected to increase by 53 percent from 2008 to 2018, placing it among the fastest growing of all occupations. This occupational category includes network architects and engineers, as well as Web administrators and developers. Demand for network architects and engineers will increase as organizations continue to upgrade their IT capacity and incorporate the newest technologies. The growing reliance on wireless networks will result in a need for many more of these workers. Workers with knowledge of information security also will be in demand, as computer networks transmit an increasing amount of sensitive data.

Demand for Web administrators and Web developers will also be strong. More of these workers will be needed to accommodate the increasing amount of data sent over the Internet, as well as the growing number of Internet users. In addition, as the number of services provided over the Internet expands, Web administrators and developers will continue to see employment increases.

Growth in computer network, systems, and database administrators will be rapid in the computer systems design, data processing and hosting, software publishing, and technical consulting industries, as these types of establishments utilize or provide an increasing array of IT services. Growth will also be rapid in healthcare, as these organizations look to increase their efficiency and improve patient care through the use of information systems and other technology.

Growth in this occupation may be tempered somewhat by offshore outsourcing, as firms transfer work to countries with lower-prevailing wages and highly skilled work forces. In addition, the consolidation of IT services may increase efficiency, reducing the demand for workers.

**Job prospects.** Computer network, systems, and database administrators should continue to enjoy excellent job prospects. In general, applicants with a college degree and certification will have the best opportunities. However, for some of these occupations, opportunities will be available for applicants with related work experience. Job openings in these occupations will be the result of strong employment growth, as well as the need to replace workers who transfer to other occupations or leave the labor force.

## Earnings

Median annual wages of network and computer systems administrators were \$66,310 in May 2008. The middle 50 percent

earned between \$51,690 and \$84,110. The lowest 10 percent earned less than \$41,000, and the highest 10 percent earned more than \$104,070. Median annual wages in the industries employing the largest numbers of network and computer systems administrators in May 2008 were as follows:

Management of companies and enterprises .....	70,680
Computer systems design and related services .....	70,490
Wired telecommunications carriers.....	66,950
Colleges, universities, and professional schools .....	57,380
Elementary and secondary schools .....	56,320

Median annual wages of database administrators were \$69,740 in May 2008. The middle 50 percent earned between \$52,340 and \$91,850. The lowest 10 percent earned less than \$39,900, and the highest 10 percent earned more than \$111,950. In May 2008, median annual wages of database administrators employed in computer systems design and related services were \$78,510, and for those in management of companies and enterprises, wages were \$74,730.

Median annual wages of network systems and data communication analysts were \$71,100 in May 2008. The middle 50 percent earned between \$54,330 and \$90,740. The lowest 10 percent earned less than \$41,660, and the highest 10 percent earned more than \$110,920. These wages encompass network architects, telecommunications specialists, Webmasters, and Web developers. Median annual wages in the industries employing the largest numbers of network systems and data communications analysts in May 2008 were as follows:

Wired telecommunications carriers.....	75,930
Insurance carriers .....	74,910
Management of companies and enterprises .....	73,720
Computer systems design and related services .....	72,410
Local government.....	64,230

## Related Occupations

Other occupations that work with information technology include:

- Computer and information systems managers
- Computer scientists
- Computer software engineers and computer programmers
- Computer support specialists
- Computer systems analysts

## Sources of Additional Information

For additional information about a career as a computer network, systems, or database administrator, contact:

➤ The League of Professional System Administrators, 15000 Commerce Pkwy., Suite C, Mount Laurel, NJ 08054. Internet: <http://www.lopsa.org>

➤ Data Management International, 19239 N. Dale Mabry Hwy. #132, Lutz, FL 33548. Internet: <http://www.dama.org>

Additional information on a career in information technology is available from the following organizations:

➤ Association for Computing Machinery (ACM), 2 Penn Plaza, Suite 701, New York, NY 10121-0701. Internet: <http://computingcareers.acm.org>

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 2001 L St. NW., Suite 700 Washington, DC 20036-4910. Internet: <http://www.computer.org>

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: <http://www.nwcet.org>

➤ University of Washington Computer Science and Engineering Department, AC101 Paul G. Allen Center, Box 352350, 185 Stevens Way, Seattle, WA 98195-2350. Internet: <http://www.cs.washington.edu/WhyCSE>

➤ National Center for Women and Information Technology, University of Colorado, Campus Box 322 UCB, Boulder, CO 80309-0322. Internet: <http://www.ncwit.org>

The Occupational Information Network (O\*NET) provides information on a wide range of occupational characteristics. Links to O\*NET appear at the end of the Internet version of this occupational statement, accessible at <http://www.bls.gov/ooh/ocos305.htm>